ZOOLOGICAL SCIENCE 3: 707–713 (1986)

Two New Hymenolepidid Tapeworms, *Vampirolepis kawasakiensis* and *Insectivorolepis mukooyamai*, with Records of Known Tapeworms from Bats of Japan[1]

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ABSTRACT—Of hymenolepidid tapeworms, five (including two new) species were recorded from bats collected at various places in Japan in 1985. *Vampirolepis kawasakiensis* sp. n. and *Insectivorolepis mukooyamai* sp. n. are described from the large Japanese noctule, *Nyctalus lasiopterus aviator,* of Kawasaki-shi, Kanagawa Prefecture and from the Natterer's bat, *Myotis nattereri bombinus,* of Lokunohe-chô, Aomori Prefecture, respectively. *V. kawasakiensis* most closely resembles *V. baeri,* but differs from it in smaller number of rostellar hooks (25 vs. 45–49), form of ovary (bilobate vs. lobulate) and arrangement of testes (transverse row vs. triangular). *I. mukooyamai* closely resembles *I. ooyabui,* but differs from it in shorter strobila, longer neck, form of ovary (trilobate vs. bilobate) and in the position of genital pores (located a little posterior to the middle vs. located a little anterior to the middle).

INTRODUCTION

In succession to the investigation in 1984 [1], various kinds of bats were examined for tapeworms to obtain supplementary data on the helminth fauna of bats in Japan. This paper reports two new hymenolepidid tapeworms with records of the known hymenolepidid tapeworms from bats in Japan.

MATERIALS AND METHODS

Bats were collected at various places in Japan (Fig. 1) from January to November, 1985. The bats were killed immediately after capture at the collection sites. Their alimentary canals were cut open as soon as possible and fixed in Carnoy's fluid. At the laboratory, after being soaked in 45% acetic acid for about 30 min for expanding, they were stored in 70% alcohol. Tapeworms obtained from these alcohol-preserved guts were rinsed in tap water for about 12 hr. Then they were stained with alcohol-hydrochloride-carmine, dehydrated in alcohol, cleared in xylene, and mounted in Canada balsam. Measurements are given in millimeters.

Accepted February 26, 1986
Received February 4, 1986

[1] This paper corresponds to "Helminth Fauna of Bats in Japan XXXIV".

RESULTS

Bats examined and tapeworms obtained are shown in Table 1.

Vampirolepis Spassky, 1954
Vampirolepis kawasakiensis sp. n.
(Figs. 2–4)

Of five large Japanese noctule, *Nyctalus lasiopterus aviator,* collected by Iguti from hollows of a zelkova tree at Tama-ku, Kawasaki-shi, Kanagawa Prefecture, on February 7, 1985, two were found infected with three mature specimens and a juvenile specimen of this tapeworm. The former were fully mature, but not gravid.

Description: Medium-sized hymenolepidid; worm length 28–35; maximum width 0.4–0.5. Metamerism distinct, margins serrate. Proglottids wider than long. Scolex 0.245 long by 0.224 wide, not demarcated from neck. Rostellum pyriform, 0.126 long by 0.098 wide, armed with a single circle of 25 hooks measuring 0.025 long. Hook handle slender; guard bluntly round at its end, slightly

Table 1. Bats examined and their tapeworm parasites, January–December 1985

Host species Cave and locality	Date	Number of bats			Tapeworm species
		examined	infected	%	
Vespertilionidae					
(1)* *Nyctalus aviator*					
2) Tree hollow Kawasaki-shi, Kanagawa Pref.	Feb. 7	5	3	60	*Vampirolepis kawasakiensis* sp. n.
(2) *Miniopterus schreibersii fuliginosus*					
4) Artificial cave Takaoka-shi, Toyama Pref.	Nov. 2	5	0	0	
7) Tunnel Ikeda-chô, Fukui Pref.	May 19	5	1	20	*V. hidaensis*
9) Sea eroded cave Fuse-mura, Oki, Shimane Pref.	July 24	13	4	31	*V. hidaensis*
(3) *Myotis macrodactylus*					
9) Sea eroded cave	July 24	22	0	0	
(4) *Myotis nattereri bombinus*					
1) Kumano Shrine Lokunohe-chô, Aomori Pref.	July 17, 18, Sept. 6, 7, 9, 10	6	3	50	*Insectivorolepis mukooyamai* sp. n.
Rhinolophidae					
(5) *Rhinolophus cornutus cornutus*					
6) Abandoned mine Takefu-shi, Fukui Pref.	May 17	11	0	0	
(6) *Rhinolophus cornutus orii*					
15) Nanati-gama Kikai-shima, Kagoshima Pref.	Jan. 25	5	0	0	
16) Hisshô-gô Kikai-shima, Kagoshima Pref.	Jan. 25	4	0	0	
17) Abandoned mine Amami-ôshima, Kagoshima Pref.	Jan. 27	18	1	6	*V. isensis*

(Table 1. Continued)

Host species Cave and locality	Date	Number of bats			Tapeworm species
		examined	infected	%	
(7) *Rhinolophus pumilus*					
18) Onaga-dô Guchichan-son, Okinawa Pref.	Dec. 15	5	0	0	
(8) *Rhinolophus ferrumequinum nippon*					
3) Snow tunnel Ôyama-chô, Toyama Pref.	Nov. 2	4	1	25	*Hymenolepis rashomonensis*
4) Artificial cave	Nov. 2	5	3	60	*H. rashomonensis*
5) Artificial cave Johana-chô, Toyama Pref.	Nov. 1	5	5	100	*H. rashomonensis*
7) Tunnel	May 19	5	1	20	*H. rashomonensis*
8) Basement Saigô-chô, Oki, Shimane Pref.	Oct. 26	2	2	100	*H. rashomonensis*
10) Sea eroded cave Saigô-chô, Oki, Shimane Pref.	Oct. 26	1	1	100	*H. rashomonensis*
11) Artificial cave Nishi-no-shima, Oki, Shimane Pref.	Oct. 27	1	0	0	
12) Sea eroded cave Nishi-no-shima, Oki, Shimane Pref.	Oct. 27	2	0	0	
13) Artificial cave Chibu-mura, Oki, Shimane Pref.	Oct. 27	1	0	0	
14) Disused air-raid shelter Chibu-mura, Oki, Shimane Pref.	Oct. 27	7	1	14	*H. rashomonensis*

* Serial No. of localities shown in Fig. 1.

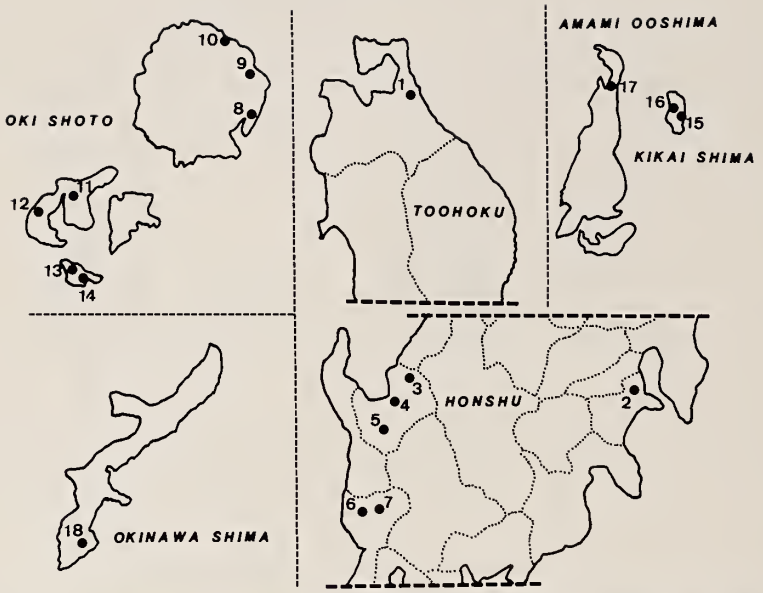
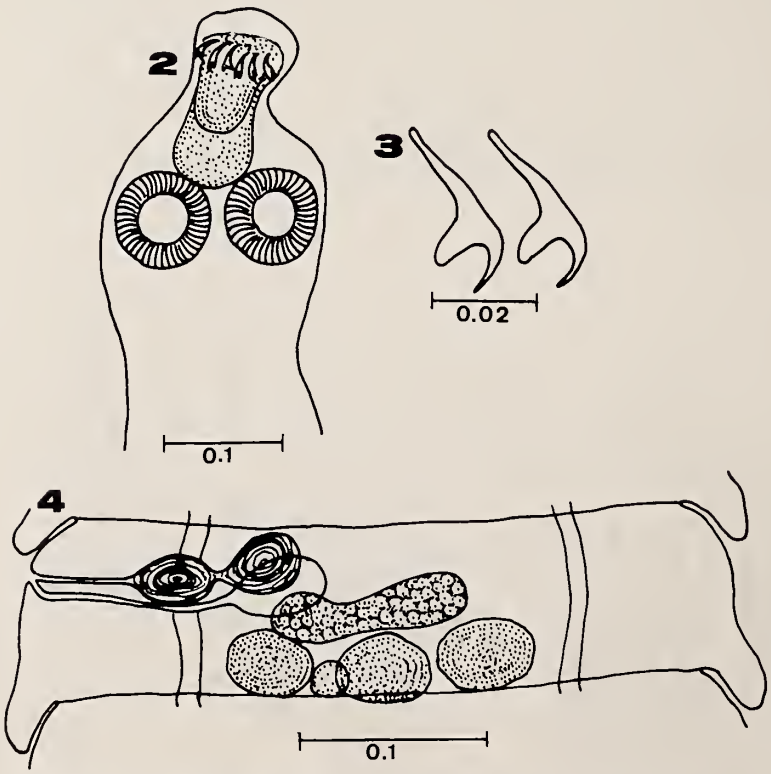


FIG. 1. Map showing the collection sites of bats. For locality numbers, see Table 1.



FIGS. 2–4. *Vampirolepis kawasakiensis* sp. n.
2: Scolex. 3: Rostellar hooks. 4: Mature proglottid. Scales in mm.

shorter than blade; blade remarkably sharp at its end. Rostellar sac elongated, 0.175 long by 0.105 wide. Suckers discoid, unarmed, 0.098 by 0.105. Neck slender, 0.35–0.42 long by 0.18 wide.

Genital pores unilateral, located a little anterior to the middle of proglottid margins. Testes three in number, oval, 0.063–0.068 by 0.052–0.058, arranged in a transverse row, one poral and two aporal. Cirrus sac pyriform, 0.154 long by 0.028 wide, extending beyond longitudinal excretory canals. Internal seminal vesicle measuring 0.070 by 0.028. External seminal vesicle oval, measuring 0.070 by 0.028–0.035. Seminal receptacle dorsal to ovary, measuring 0.056 by 0.028–0.035. Vitelline gland compact, 0.021 in diameter, situated in posterior field of proglottid. Ovary transversely elongated, bilobate, 0.140–0.175 wide. Gravid and senile proglottids unknown.

Host: *Nyctalus lasiopterus aviator.*

Site of infection: Small intestine.

Locality and date: Suge, Tama-ku, Kawasaki-shi, Kanagawa Prefecture; February 7, 1985.

Type specimen: Holotype: NSU Lab. Coll. No. 8601. Paratypes: No. 8602.

Remarks: So far as known to the author, four species belonging to *Vampirolepis* Spassky: *V. baeri* Murai, 1976 [2], *V. skryabineriana* Spassky, 1954 [3], *V. christensoni* (Macy, 1931) [4] and *V. spasski* Andreiko, Skvortsov et Konovalov, 1969 [5], have been recorded from the bats of the genus *Nyctalus*. Of these, the present species closely resembles *V. baeri* from *N. noctula* in Hungary in the length and form of rostellar hooks. However, it differs from *V. baeri* in the smaller number of rostellar hooks (25 vs. 45–49), the form of ovary (bilobate vs. lobulate) and the arrangement of testes (transverse row vs. triangular).

Vampirolepis isensis Sawada, 1966 [6]

Host: *Rhinolophus cornutus orii.* For localities, see Table 1 and Figure 1.

Vampirolepis hidaensis Sawada, 1967 [7]

Host: *Miniopterus schreibersii fuliginosus* and *M. schreibersii blepotis.* For localities, see Table 1 and Figure 1.

Hymenolepis Weinland, 1858

Hymenolepis rashomonensis Sawada, 1972 [8]

Host: *R. ferrumequinum nippon.* For localities, see Table 1 and Figure 1.

Insectivorolepis Zarnowski, 1956

Insectivorolepis mukooyamai sp. n.

(Figs. 5–8)

From July 17 to November 11, 1985, six specimens of *Myotis nattereri bombinus* were collected by Mukooyama at Kumano Shrine, Lokunohe-chô, Aomori Prefecture. Three of them were found infected with 14 mature specimens and 27 juvenile specimens of this tapeworm.

Description: Small-sized hymenolepidid; strobila 6–8 in length; maximum width 0.4–0.5. Metamerism distinct, margins slightly serrate. Scolex unarmed, 0.210–0.252 long by 0.203–0.217 wide, not sharply demarcated from neck. Four suckers unarmed, 0.105–0.112 long by 0.091–0.098 wide. Unsegmented neck region long, 0.56–0.64 long by 0.084–0.140 wide.

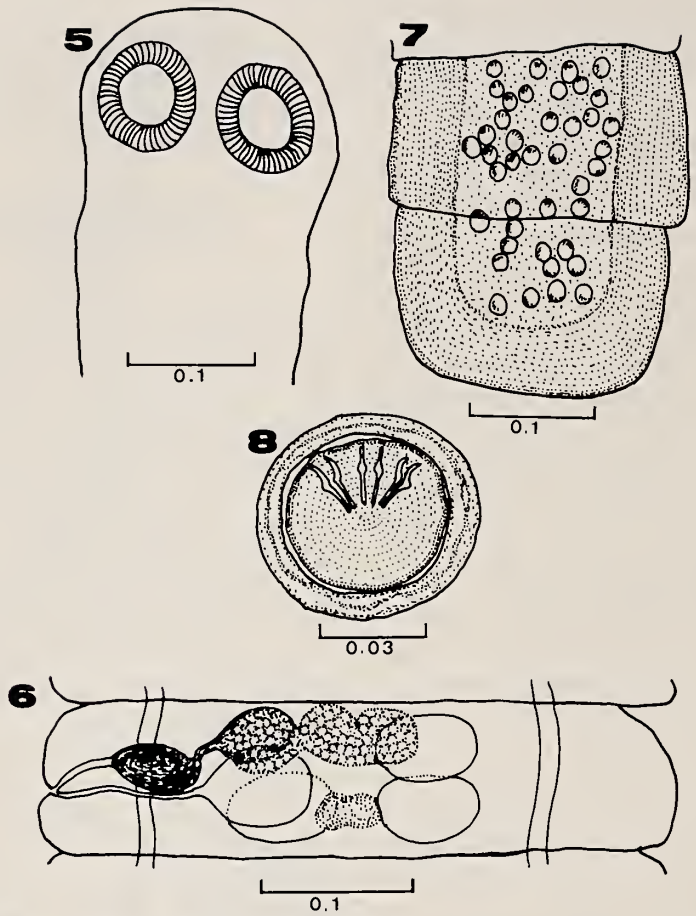
Genital pores unilateral, located a little posterior to the middle of proglottid margins. Testes three in number, subspherical, 0.070–0.077 by 0.042–0.056, situated in the posterior field of proglottid and arranged in a triangle, one poral and two aporal. Cirrus sac pyriform, 0.091–0.105 long by 0.028 wide. Internal seminal vesicle 0.049 by 0.028–0.035, occupying almost whole of cirrus sac, external seminal vesicle 0.035–0.049 by 0.021–0.042. Ovary trilobate, 0.053 by 0.074–0.084 wide. Vitelline gland lying posterior to ovary, 0.045–0.049 by 0.028–0.032. Saccated seminal receptacle 0.077–0.098 by 0.049–0.070, overlapping poral testis. Uterus arising directly from ovarian lobes as a lobe sac, which is gradually enlarging, not fulling entire gravid proglottid. Eggs spherical, 0.045–0.049 in diameter, surrounded by four thin envelopes. Onchospheres spherical, 0.039 in diameter; embryonic hooks 0.014 long.

Host: *Myotis nattereri bombinus.*

Site of infection: Small intestine.

Locality and date: Lokunohe-chô, Aomori Prefecture; July 17, 1985.

Type specimen: Holotype: NSU Lab. Coll.



FIGS. 5–8. *Insectivorolepis mukooyamai* sp. n.
5: Scolex. 6: Mature proglottid. 7: Senile proglottid. 8: Egg. Scales in mm.

No. 8603. Paratypes: No. 8604.

Remarks: The tapeworms belonging to the genus *Insectivorolepis* have hitherto been isolated from *Rhinolophus ferrumequinum nippon*, collected at various parts westward from Chiba Prefecture. This is the first record from Toohoku district and from *Myotis nattereri bombinus* in Japan.

The present new species closely resembles *I. ooyabui* [9] from *R. ferrumequinum nippon* in the form of scolex and the arrangement of testes. However, it differs from *I. ooyabui* in the shorter strobila (7–8 vs. 32–81), longer neck (0.56–0.64 vs. absent), the position of genital pores (located a little posterior to the middle vs. anterior to the middle) and the form of ovary (trilobate vs. bilobate).

ACKNOWLEDGMENTS

This study was supported by a Grant-in-Aid for Scientific Research from the Ministry of Education, Science and Culture, Japan. I am indebted to Miss Mizuko Yoshiyuki, National Science Museum (Nat. Hist.), Tokyo, and Mr. Mitsuru Mukooyama, Sannohe High School, for supplying the alimentary canals of bats and to Mr. Masashi Harada, Laboratory of Experimental Animals, Osaka City University Medical School, for his generous cooperation. Thanks are also due to Messrs. Futoshi Nozu, Sumitaka Yuasa, Masahide Nakazi and Yokichi Iguti, for kind helps in collection or donation of bats.

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